CALIFORNIA DIVISION OF MINES AND GEOLOGY
FAULT EVALUATION REPORT FER-170

San Simeon Fault Zone and Cambria Fault
San Luis Obispo County, California

By
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INTRODUCTION

Potentially-active faults near San Simeon, which is on the coast in northwestern San Luis Obispo County, have been examined as part of CDMG's Fault Evaluation Program. These faults include the Cambria fault and the several strands within the San Simeon fault zone. The San Simeon fault zone is located in the San Simeon, Burro Mountain, and Piedras Blancas 7.5' quadrangles. Several workers (Hall, 1975, 1978; Leslie, 1980; Weber, 1981) consider the San Simeon fault zone to be an on-land segment of the San Gregorio-Hosgri fault zone, a zone with supposedly major right-lateral strike-slip displacement. Weber and others (1981) have provided evidence of possible Holocene faulting at the southern end of the San Simeon fault. The Cambria fault is located to the southeast of the San Simeon fault zone, and has been hypothesized to be a continuation of the latter (Earth Science Associates, 1975). Those fault segments determined to meet the necessary criteria of "sufficiently active and well-defined" will be zoned by the State Geologist as directed under the Alquist-Priolo Special Studies Zones Act (see Hart, 1985, p. 5-6).

SUMMARY OF AVAILABLE DATA

SAN SIMEON FAULT ZONE

The San Simeon fault zone is complex, and consists of several subparallel Quaternary faults, some of which have been named by Hall (1976), between San Simeon Point and Ragged Point (see Figure 1 and Jennings, 1975). Hall (1975) considers the San Simeon fault zone to be an onshore segment of the offshore [San Gregorio-] Hosgri fault zone. He states that 80 to 95 km of right-lateral strike-slip displacement has occurred along the northwest-trending San Simeon-Hosgri fault zone since late Miocene time. This estimate of offset is based on correlation of the ophiolitic rocks and Tertiary sedimentary units at San Simeon with similar units at Point Sal in northwestern Santa Barbara County. Graham and Dickinson (1978, p. 19) support Hall's hypothesis of large-scale displacement along the San Simeon-Hosgri fault zone, but indicate that total displacement is more likely 85 to 110 km. In addition, they believe that the San Simeon-Hosgri fault zone connects with the San Gregorio-Hosgri fault zone to the northwest. Leslie (1980) provides evidence for the existence of an offshore connection between the San Simeon and Hosgri fault zones, using nearshore high-resolution seismic refraction data.

The most detailed geologic maps (scale 1:24,000), of the San Simeon area are those by Hall (1976) and Weber (1981); their traces are shown on Figures 2A and B. Hall and others (1979) include a reduced-scale (1:48,000) map of Hall (1976) with additional cross-section detail. Envicom (1977) also mapped

the southeastern half of the fault zone in detail and did exploratory work, including trenching and magnetometer surveys, in order to evaluate the recency of faulting. Several of Hall's fault traces have been relocated by Envicom. Selected traces of Envicom, as well as their trenches, are plotted on Figure 2A.

Hall (1976) divided the Quaternary units into alluvium, dune sand, and older dune sand (Holocene), stream terrace deposits (Holocene to Pleistocene), and marine terrace deposits (Pleistocene). Most of the faults mapped by Hall displace the marine terrace deposits, but are shown to be concealed by the younger units. Weber (1981) mapped the late Pleistocene marine terraces in detail between Ragged Point and Cayucos, and tentatively correlated individual terrace surfaces with previous elevated sea levels. The lowest, most recent terrace is the Piedras Blancas terrace. Weber locally divides this terrace into the younger deposits of the San Simeon platform [lower platform] and older deposits of the Tripod platform [upper platform]. He correlates the upper [Tripod] platform with the terrace at Cayucos that has been radiometrically age-dated at approximately 125,000 years B.P. The lower platform and its deposits are estimated by Weber to be either 105,000 years old or 65,000 years old, based upon his correlations of terrace elevations, uplift rates, and previous elevated sea levels. Other terraces mapped by Weber are higher and older than the Piedras Blancas terrace. Using his estimates of the ages of the various faulted terraces and the existance of fault-related geomorphic features along individual fault segments, Weber classifies each fault as either "recently active and late Pleistocene", "early to middle Pleistocene", or "pre-Pleistocene".

Arroyo Laguna fault

The Arroyo Laguna fault is the easternmost of the main faults within the San Simeon fault zone (Hall, 1976). As shown by Hall (see Figure 2A), the fault extends from the coast north of San Carpoforo Creek, 18 km southeastward to the vicinity of San Simeon, where it merges with the San Simeon fault. The fault displaces graywacke and mélange of the Franciscan Complex (Hall, 1976; Hall and others, 1979). It offsets Pleistocene marine terrace deposits south of Arroyo de la Cruz, but does not displace Holocene alluvium in any of the drainages. Between Arroyo de la Cruz and San Carpoforo Creek, the Arroyo Laguna fault is largely concealed by massive landslides, and its location is in part inferred.

Envicom (1977) used magnetometer surveys to relocate segments of Hall's Arroyo Laguna fault. In addition, 3 trenches were dug for Envicom to examine the fault in detail (Figure 2A). Trenches 7 and 8, located near the southeast end of the fault, did not expose any shear zones. However, in the log for Trench 7 (Figure 9) terrace deposits appear to be warped at the trench's southwest end. Trench 2, located south of Arroyo de la Cruz (see Figure 5) exposed two shear zones in Franciscan mélange. At Station 45, "terrace or old slope wash" is faulted against the mélange. The fault trends N52°W and dips 62°W, with the southwest side apparently thrust over the northeast side approximately 3 feet. [No slickensides were noted, and no strata or marker beds are shown in the log. The overlying soil is not shown to be faulted.] At Stations 15-20, a vertical shear zone that is 4 feet wide trends N40°W. Both faults are truncated by undisturbed brown soil.

Weber (1981) shows the Arroyo Laguna fault south of Arroyo de la Cruz as displacing late Pleistocene marine terrace deposits that he considers to be older than the Piedras Blancas terrace (125,000 years B.P.). The fault trace is concealed by Holocene alluvium in Arroyo de la Cruz, and concealed by late Pleistocene to Holocene river terraces and Holocene alluvium in San Carpoforo Creek. In addition, he shows several minor faults branching from the Arroyo Laguna fault. Some of these branch faults locally are shown to offset Holocene alluvium, but this is probably a drafting error, because Weber classifies these particular branch faults as "Early to Middle Pleistocene faults". He states in his report (p. 59) that the evidence for Holocene fault displacement is restricted to the sea cliff at San Simeon Bay [on the San Simeon fault].

San Simeon fault

The San Simeon fault extends from Ragged Point 19 km southeastward to San Simeon Point, with an inferred offshore extension southeastward to Estero Bay (Earth Science Associates, 1975; Hall, 1976; Hall and others, 1979). The San Simeon fault lies southwest of and parallel to the Arroyo Laguna fault, and is shown to merge with the latter immediately north of San Simeon Bay (Figure 2A). The fault consists of several strands, which separate mélange, shale, and graywacke of the Franciscan Complex on the northeast from Jurassic ophiolitic rocks and Tertiary sedimentary rocks on the southwest. Strike-slip movement is indicated by the 3 km of right-lateral displacement of Arroyo de la Cruz along the mapped trace of the fault. The San Simeon fault is shown in cross section by Hall and others (1979) to be vertical, with the northeast side down, and to form a graben-like structure near San Simeon Bay in conjunction with the Arroyo Laguna fault. Weber (1981) and Weber and others (1981) noted less than 1 foot (0.3 m) of [apparent] normal fault displacement (northeast side down) on the San Simeon fault in a sea cliff at San Simeon Bay. They estimate the time of deposition of the faulted dune sand as 15,000 to 5,000 years B.P. [They did not observe slickensides in the slightly cemented dune sand, so right-lateral oblique-slip along the fault is not precluded.] The upper portion of the dune sand deposit is not faulted.

Further to the northwest along the San Simeon fault, in Trenches 3, 4, 5, and 6 of Envicom (1977), the terrace deposit is faulted, but the uppermost soil in each trench appears undisturbed (see Figures 6-8). Hall (1976) identifies the terrace deposit as Pleistocene, while Weber (1981) shows it to be late Pleistocene but older than the Piedras Blancas terrace (125,000 years B.P.). Trench 1 of Envicom was located 6 km further to the north (see Figure 2A), on a trace mapped by both Hall and Weber. Envicom interpreted the contact in the trench as being depositional (see Figure 4), but Weber disagrees (p. 51), and reinterprets the log as indicating offset of the terrace deposit, with 8 to 9 feet of vertical displacement. The overlying soil unit is shown in the log as not faulted. North of trench 1, the fault is shown by both Hall (1976) and Weber (1981) as striking more westerly and underlying a 3 km - long portion of Arroyo de la Cruz before reaching the coast immediately north of Breaker Point (See Figure 2A). At the coast, the fault is concealed by terrace deposits on the lower platform of the Piedras Blancas terrace. As shown in Figure 2A, the San Simeon fault swings northwestward to intersect Ragged Point, where Hall and Weber both show the upper platform deposits of the Piedras Blancas terrace to be unfaulted.

Arroyo del Oso fault

The Arroyo del Oso fault (Hall, 1976; Hall and others, 1979; Weber, 1981) is a west-northwest-trending, moderately northeast-dipping reverse fault, which splays off of the San Simeon fault near Oak Knoll Creek (see Figure 2A). In cross section Hall shows ophiolitic rocks thrust southwestward over Franciscan Complex mélange and Jurassic-Cretaceous graywacke. Although its position is inferred locally, Hall shows the fault displacing Pleistocene marine terrace deposits. The fault is exposed in the sea cliff north of Arroyo del Oso, where Hall and others (1979) note "Lower part of terrace deposits displaced 20 or 30 cm, upper part not disturbed". [All four references -- Hall, Hall and others, Weber, and Envicom (1977) -- show the fault as a dashed line (approximately located or inferred) across the terrace unit, although the upper part of the unit is not displaced.]

Weber (p. 52-53) interprets the Arroyo del Oso fault as having both reverse and strike-slip components, with an extension of the main trace northwestward along the lower valley of Arroyo de la Cruz; he believes the west-trending reverse fault exposed at the sea cliff is a secondary trace. He shows the northwest extension in cross section to consist of two vertical faults separated by an uplifted block. Evidence cited by Weber for existence of the northwestern extension includes 1) "the distribution of marine terraces" [Weber includes no further discussion of this topic.], and 2) the lower valley of Arroyo de la Cruz trends northwestward, with the mouth of the canyon lying northeast of Point Sierra Nevada, instead of southeast of the point, where the stream presently discharges into the ocean. The northwestern extension fault is shown to offset a pre-Piedras Blancas terrace deposit, but is concealed by older dune sands and river terrace deposits (late Pleistocene to Holocene) and Holocene alluvium. [On his map Weber shows the fault zone as dashed lines across the terrace deposits and alluvium.] The "secondary" trace exposed on the sea cliff has 10 to 20 feet [3-6 m] of reverse displacement of the wave cut platform (lower platform of the Piedras Blancas terrace). Weber states that the lower platform at this location is either 105,000 years old or possibly 65,000 years old. The faulted deposits are probably alluvium from Arroyo del Oso; the time of deposition is not known but is definitely prior to 20,000 years B.P.- the time of the latest lowered sea level. He estimates that the deposits may be as young as 40,000 years, but gives no supporting evidence.

Unnamed fault strands

Several unnamed fault strands have been mapped within the San Simeon fault zone (see Figure 2A). Two faults extend to the coast between Ragged Point and Arroyo de los Chinos. These two faults and their minor branch faults are mapped as displacing various terrace deposits equal in age or older than the deposits on the upper platform of the Piedras Blancas terrace. Weber infers that the northernmost of these faults, which trends parallel to Hall's San Simeon fault, may have caused 2-4 feet [0.6 - 1.2 m] of vertical displacement of the deposits. However, both of the main fault strands are shown as being concealed by deposits on the lower platform of the Piedras Blancas terrace. Inferred faults shown by Hall (1976) and Hall and others (1979) south of Arroyo del Oso and southwest of the Arroyo del Oso fault (Figure 2A) are concealed locally by deposits associated with the upper platform of the Piedras Blancas terrace or older terraces. At Piedras Blancas Point, Hall

(1976) and Hall and others (1979) show a northwest-trending fault concealed by Holocene dune sand. Weber (1981) shows the fault to trend more easterly, and infers that the fault displaces both platforms of the Piedras Blancas terrace.

OCEANIC FAULT (northwest segment)

The Oceanic fault is considered the structural boundary between the Santa Lucia and San Simeon-Cambria structural blocks (Weber, 1981, P. 54). The northwest end of the Oceanic fault apparently intersects the San Simeon fault zone from the southeast (Figure 2A). Hall (1976) shows the fault as a single strand with several small fault-bounded linear bodies of serpentinite. According to Hall (1976), the youngest unit faulted is the Rincon shale (Oligocene and lower Miocene) approximately 2.5 km southeast of Oak Knoll Creek (not shown on Figure 2A). Although Hall (1975, p. 4) states that the Oceanic fault is "terminated" by the San Simeon fault, the Oceanic fault is concealed at the junction and elsewhere by Pleistocene marine terrace deposits (Hall, 1976; Hall and others, 1979). Weber identifies two strands southeast of Oak Knoll Creek, with the fault becoming a single strand at its northwest end. He shows the fault concealed locally by older, pre-Piedras Blancas terrace deposits.

CAMBRIA FAULT

The Cambria fault extends approximately 22 km southeastward from San Simeon Creek to the north shore of Estero Bay (Figure 2B). Hall and others (1979) show the Cambria fault in cross section to be a vertical to very steeply southwest-dipping normal fault that offsets Cretaceous sandstone and Franciscan Complex graywacke and mélange. The fault pattern is complex, and the Cambria fault is the northeastern boundary of a body of Franciscan Complex mélange emplaced between the Cretaceous sandstone on the southwest and Franciscan Complex graywacke and Lospe Formation (Oligocene) on the northeast. Hall and others (1979) infer that two concealed faults extend northwestward beneath Pleistocene terrace deposits and Holocene alluvium from Cambria to San Simeon Beach State Park. Weber (1981) does not show either of the extensions. Approximately 1 km south of Cambria, Weber notes that an older, pre-Piedras Blancas terrace may be offset along two strands of the Cambria fault. He infers that the Cambria fault may offset the upper platform of the Piedras Blancas terrace at the mouth of Ellysly Creek, citing an apparent difference in elevation of 10 feet [3 m] (west side up) between the shoreline angles separated by the creek. Hall and others (1979) and Weber note a possible offset of the terrace deposits at Estero Bay. Weber identifies these deposits as the upper platform of the Piedras Blancas terrace. All workers show the strands of the Cambria fault locally as concealed by Holocene alluvium.

AIR PHOTO INTERPRETATION AND FIELD OBSERVATIONS

Two sets of air photos were available to the author: U.S. Department of Agriculture, 1956, series AXH, black and white, scale 1:20,000 (in CDMG files); and U.S. Department of Agriculture, 1980, series 06079, color infrared, scale 1:40,000 (enlarged to 1:24,000; in the Paso Robles office of Soil Conservation Service). A set of color infrared air photos, used by Weber (1981) during his study, is in the possession of Envicom, Inc., but could not be located by that company for use by the author. E.W. Hart assisted in photo interpretation. Field observations were made by the author during May 20-24,

1985 and by E.W. Hart and the author during August 20-21, 1985. The segment of the Arroyo Laguna fault between Arroyo de la Cruz and San Carpoforo Creek was not field checked, because of its rugged terrain and lack of access roads. Trench locations shown in Figures 2A and 3 are based upon Envicom (1977) and Weber (1981). The locations of trenches 2, 7, and 8 could not be verified in the field by the author.

SAN SIMEON FAULT ZONE

San Simeon fault and Arroyo Laguna fault

Geomorphic features suggestive of recent right-lateral displacement exist along the San Simeon and Arroyo Laguna faults southeast of Arroyo de la Cruz (see Figure 3). These fault segments are moderately well defined by alignments of scarps, linear drainages, saddles, sidehill benches, tonals, and right-laterally deflected drainages. These alignments generally coincide with faults exposed in the trenches of Envicom (1977). Numerous minor faults splay from the two main faults, as shown by Hall (1976) and Weber (1981). Several of these faults are visible on the air photos, but lack compelling evidence of recent displacement, or even continuity.

The active traces of the Arroyo Laguna fault become difficult to follow north of Arroyo de la Cruz to San Carpoforo Creek, due to massive landsliding. The alignment of geomorphic features mentioned above intersects the Arroyo de la Cruz, but there is no photo evidence of right-lateral displacement of the drainage at that location. The position of the northern segment of the active fault trace is suggested by the 3 km, right-lateral displacement of Arroyo de la Cruz, and by an alignment of right-lateral deflections in several of the larger drainages north of the Arroyo. However, the alignment of deflected drainages could not be traced across the entire distance between the two large drainages.

North of San Carpoforo Creek, the fault can be traced across the upper platform of the Piedras Blancas terrace (125,000 y.B.P.) as a series of southwest-facing scarps that align with a right-laterally offset stream, and with a northwest-trending shear zone in bedrock that is exposed on the beach. In a road cut on the north side of the highway, terrace gravels strike N60°E, and dip 12°N, while the terrace surface across the road to the west dips to the south and southwest. This anomalous combination of dipping surfaces is permissive of fault displacement in the terrace deposits.

The best evidence for recent faulting along the Arroyo Laguna fault and San Simeon fault (south half), other than the tonals, troughs, deflected drainages, saddles, and sidehill benches in late Pleistocene marine terrace deposits (Figure 3), is the fault reported by Weber (1981) and Weber and others (1981) in latest Pleistocene to Holocene dune sand at San Simeon Bay. Due to slumping at the reported exposure, the fault could not be verified, but an erosional, east-facing scarp (fault-line scarp?) in highly contorted and fractured Monterey Formation shale is exposed immediately west of the reported fault.

Evidence against recent displacement along the northern segment of the San Simeon fault can be summarized as follows:

1) The mapped trace of the fault is shown by both Hall (1976) and Weber (1981), to lie within the right-laterally displaced channel of Arroyo de la Cruz and cross a northeast-trending ridge at the large bend in the river (see Figure 3). Although fault movement is indicated by the presence of subhorizontal grooves within bedding planes in northwest-trending, steeply southwest-dipping graywacke that forms the ridge, the ridge shows no photo evidence of right-lateral displacement.

2) Immediately north of Breaker Point, the fault's main strand and a parallel, secondary strand (Hall, 1976; Weber, 1981) are covered by approximately 10 meters of apparently unfaulted deposits on the lower platform of the Piedras Blancas terrace (Figure 2A).

3) At Ragged Point, both the San Simeon fault and the secondary fault are concealed by brush-covered terrace deposits on the upper platform of the Piedras Blancas terrace (Figure 2A). Although sea cliff exposures are partially covered by slumping, no indication of displacement of the terrace deposits was seen, neither on the air photos nor in the field. The possible 2-4 feet [0.6 m-1.2 m] of vertical offset in the base of the terrace deposits reported by Weber (1981) could not be verified. However, a major northwest-trending shear zone, locally with subhorizontal striations, is exposed in Franciscan mélange at Ragged Point.

Arroyo del Oso fault

The Arroyo del Oso fault is poorly defined on the air photos, but can be identified locally as an alignment of erosion-modified linear drainages, swales, and tonals. The best evidence for recency of faulting is on the coast, where the Arroyo del Oso fault (Hall, 1976) is exposed in the sea cliff at low tide. The fault strikes N80°E, dips 33°N, and has 24 cm of reverse displacement in light brown to reddish sand and gravel deposits on the lower platform of the Piedras Blancas terrace. However, the displaced strata are overlain by 2.0 m of unfaulted silt, clay, and black soil. An undisturbed, 30 cm thick, alluvial fan deposit overlies the soil at this location.

Unnamed faults

The several unnamed faults shown by Hall (1976), Hall and others (1979), and Weber (1981) are moderately to poorly defined on the available air photos, being concealed locally by Holocene dune sand or marine terrace deposits. No systematic evidence of recent activity along these faults was seen by the author, neither on the air photos nor in the field.

OCEANIC FAULT (northwest segment)

The Oceanic fault is difficult to trace as a surface feature near its junction with the San Simeon fault zone, being concealed locally by deposits of a pre-Piedras Blancas terrace. No evidence of recent faulting was seen by the author, neither on the air photos nor in the field.

CAMBRIA FAULT

The Cambria fault is largely concealed by the landslides associated with mélange terrain of the Franciscan Complex. No evidence was seen on the air photos of surface faulting in the Holocene stream alluvium. The possible

offset of the upper platform of the Piedras Blancas terrace, reported by Weber (1981) at the mouth of Ellysly Creek, could not be confirmed by the author, neither on the available air photos nor in the field. The possible fault offset of the terrace unit at Estero Point (Hall, 1976; Hall and others, 1979; Weber, 1981) could not be verified in the field by the author, due to access restrictions.

SEISMICITY

'A' and 'B' quality seismic data (U.S.G.S., 1985) indicates no epicenters of earthquakes with M= 1.0 or greater were located in the vicinity of the San Simeon fault zone or Cambria fault during the period 1969-1984. An epicenter map using 'C' quality seismic data for the same period indicates some activity near the northwest end of the San Simeon fault zone, and several events were distributed elsewhere along the faults.

CONCLUSIONS

Based upon the data presented above, the following conclusions were reached:

1. The complex, northwest-trending San Simeon fault zone is a major zone of post-Miocene right-lateral displacement (80-110 km), with elements of normal and reverse faulting. The zone consists of the San Simeon, Arroyo Laguna, and Arroyo del Oso faults, and several unnamed faults that splay northwestward from the above-named faults. Geologic mapping by Hall (1976) and offshore seismic work by Leslie (1980) support Hall's (1975) hypothesis that the San Simeon fault zone is part of the [San Gregorio-] Hosgri fault zone.

2. The San Simeon fault consists of several strands, which separate rocks of the Franciscan Complex on the northeast from Jurassic ophiolitic rocks and Tertiary sedimentary rocks on the southwest. The fault is shown in cross-section to be vertical (northeast side down). Strike-slip movement is indicated by the 3 km of right-lateral displacement of Arroyo de la Cruz. The best-defined segment of the fault lies between San Simeon Bay and Arroyo de la Cruz, where the fault can be traced as an alignment of deflected drainages, saddles, tonals, and sidehill benches, in both terrace deposits and bedrock.

The San Simeon fault has been shown by Weber and others (1981) to have approximately 1 foot (0.3m) of apparent normal displacement (northeast side down) at San Simeon Bay, in dune sand deposits estimated to be 5,000 to 15,000 years old. Both Hall and Weber show the fault to offset Pleistocene marine terrace deposits approximately 1 km to the northwest. Envicom (1977) exposed offset terrace deposits in several of their trenches across the fault trace. At Ragged Point, the San Simeon fault does not displace terrace deposits on the upper platform of the Piedras Blancas terrace [correlated by Weber with the Cayucos terrace dated at 125,000 y.B.P.], but Weber infers that an adjacent parallel fault may have vertically offset the base of the terrace deposits as much as 2-4 feet [0.6 m to 1.2 m] (northeast side down). However, both Hall and Weber indicate that at Breaker Point the San Simeon fault and an adjacent, parallel fault do not offset the lower platform of the Piedras Blancas terrace (estimated by Weber to be either 105,000 or 65,000 years old).

Based upon this evidence, either the San Simeon fault has been recently active only south of Arroyo de la Cruz, or the fault has been recently active south of Arroyo de la Cruz, with fault movement stepping over to the Arroyo Laguna fault in the vicinity of Arroyo de la Cruz.

3. The Arroyo Laguna fault is shown by Hall (1976), Hall and others (1979), and Weber (1981) to be the northeasterly element of the San Simeon fault zone. They show the fault to be vertical with displacements locally down to the southwest and down to the northeast. Right-lateral strike-slip movement along the fault is indicated by the linear distribution of rock units along the fault, the linear geomorphic features along Arroyo Laguna, and the right-lateral offsets of San Carpoforo Creek, Arroyo Laguna, and Oak Knoll Creek. North of San Carpoforo Creek, the fault can be traced across the upper platform of the Piedras Blancas terrace (125,000 y.B.P.) as a series of southwest-facing scarps that align with a right-laterally offset stream, and with a northwest-trending shear zone in bedrock that is exposed on the beach. The Arroyo Laguna fault is difficult to follow as a surface feature between Arroyo de la Cruz and San Carpoforo Creek due to massive landslides. However, the location of the active trace is suggested by right-lateral deflections of the larger drainages. Between Arroyo de la Cruz and Oak Knoll Creek, the Arroyo Laguna fault lies at the base of a 40 meter high, northeast-facing scarp that is considered by Weber and others (1981) to be fault-produced. Southeast of Oak Knoll Creek the fault may merge with the San Simeon fault, but this junction is concealed by young alluvium.

4. The remaining fault strands within the San Simeon fault zone are not well-defined surface features. With the exception of the concealed fault at Piedras Blancas Point, the remaining fault strands are locally concealed by marine terrace deposits of late Pleistocene age (Weber, 1981). Although Weber infers that the fault at Piedras Blancas Point has displaced both the upper and lower platforms of the Piedras Blancas terrace, the fault is apparently concealed by young dune sands. Based on this data, the several unnamed faults have not been Holocene active, although the faults at Piedras Blancas Point may have displaced late Pleistocene terrace deposits.

5. The steeply dipping Oceanic fault apparently is truncated by the Arroyo Laguna fault (Hall, 1975), but the nature of the faults' junction is unclear, due to a veneer of late Pleistocene marine terrace deposits. The northwest segment of the Oceanic fault is locally concealed by the terrace deposits, indicating a long period of inactivity, for Hall (1976) shows the youngest unit faulted is the Rincon shale (Oligocene and lower Miocene).

6. The Cambria fault is a northwest-trending reverse fault extending from Estero Bay to Cambria, and is inferred by Hall and others (1979) to extend northwestward from Cambria to San Simeon State Park beneath Pleistocene terrace deposits and Holocene dune sands. The fault strands are shown to be moderately well-defined in bedrock (mostly solid lines) between Villa Creek and Cambria, but were difficult to verify on air photos. The various fault strands are concealed by Holocene stream alluvium at several locations. Possible faulting of the upper platform of the Piedras Blancas terrace along Estero Bay and at the mouth of Ellysly Creek (Hall and others; Weber, 1981), could not be confirmed by this writer.

RECOMMENDATIONS

Based upon the conclusions reached above, I recommend that the San Simeon fault be zoned between San Simeon Point and Arroyo de la Cruz, and that the Arroyo Laguna fault be zoned between Oak Knoll Creek and the coast north of San Carpoforo Creek, as shown on Figure 3 of this report, as they meet the necessary criteria for zoning. References cited should include Hall (1976), Weber (1981), and this report. The San Simeon fault north of Arroyo de la Cruz, the Arroyo del Oso fault, the various unnamed faults within the San Simeon fault zone, the northwest end of the Oceanic fault, and the Cambria fault should not be zoned, as they do not meet the criteria of "sufficiently active and well-defined".

Report has been reviewed. Recommendations are approved.
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10/15/85

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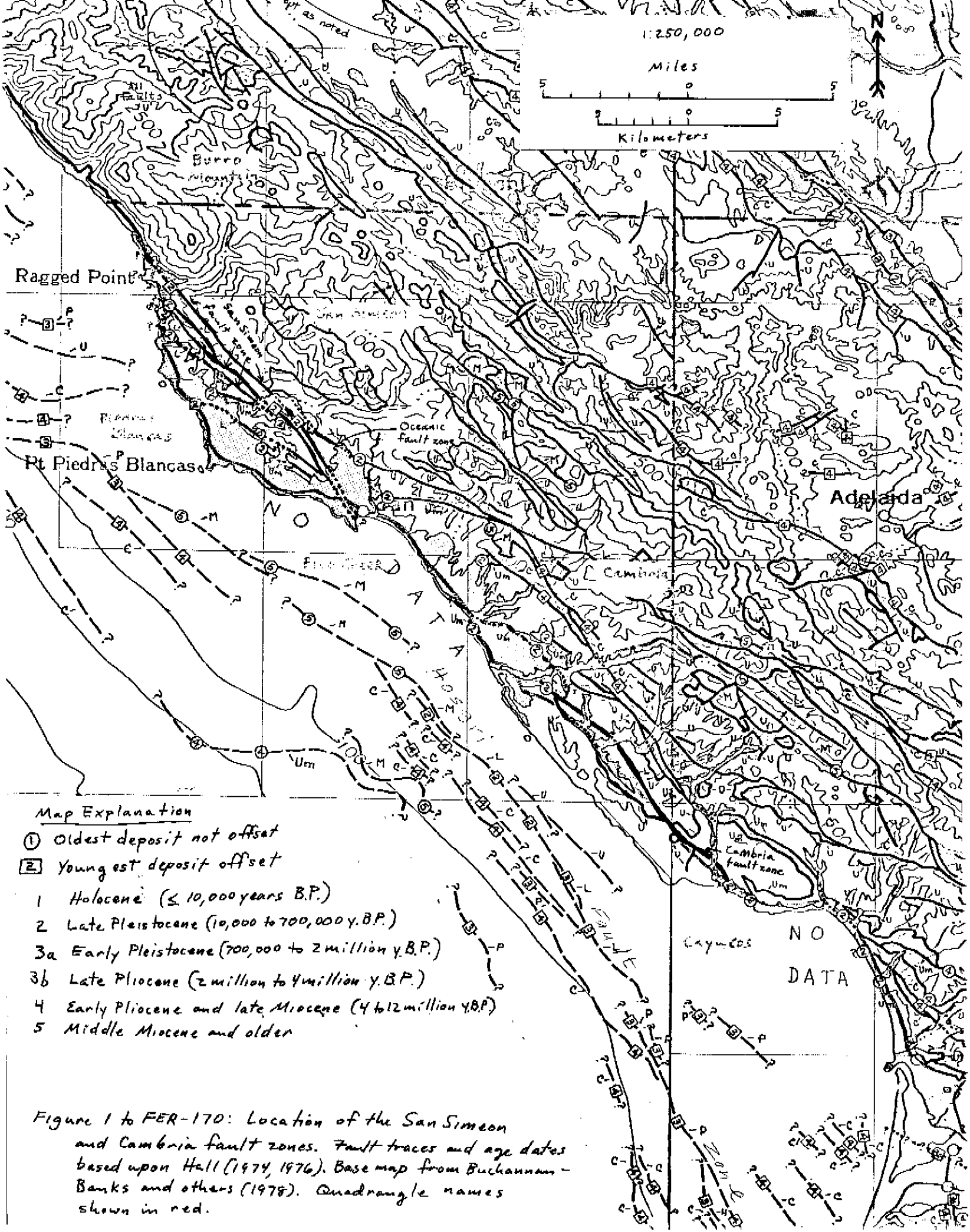


Figure 1 to FER-170: Location of the San Simeon and Cambria fault zones. Fault traces and age dates based upon Hall (1974, 1976). Base map from Buchannan-Banks and others (1978). Quadrangle names shown in red.

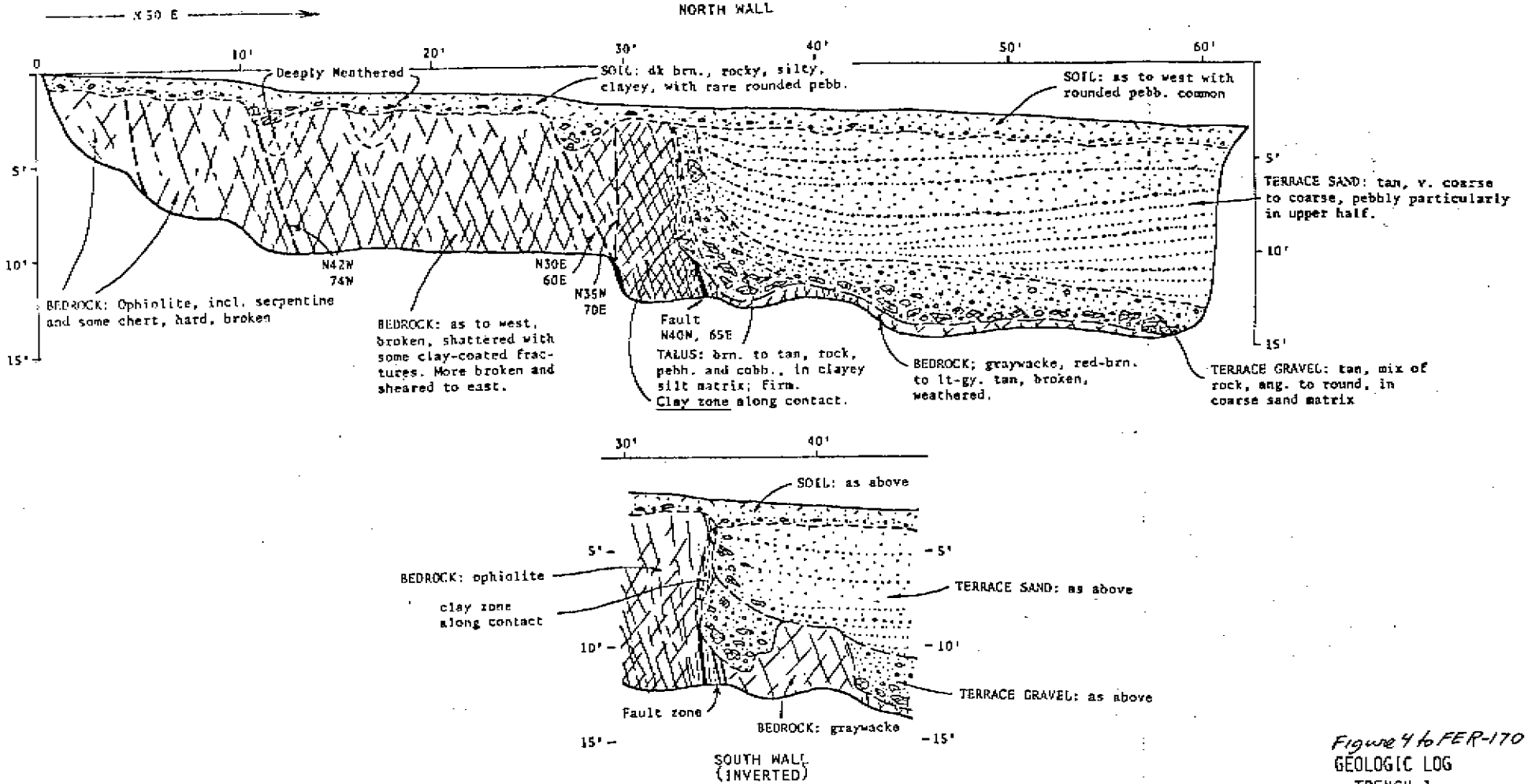


Figure 4 to FER-170
GEOLOGIC LOG
TRENCH 1
(Envicom, 1977)

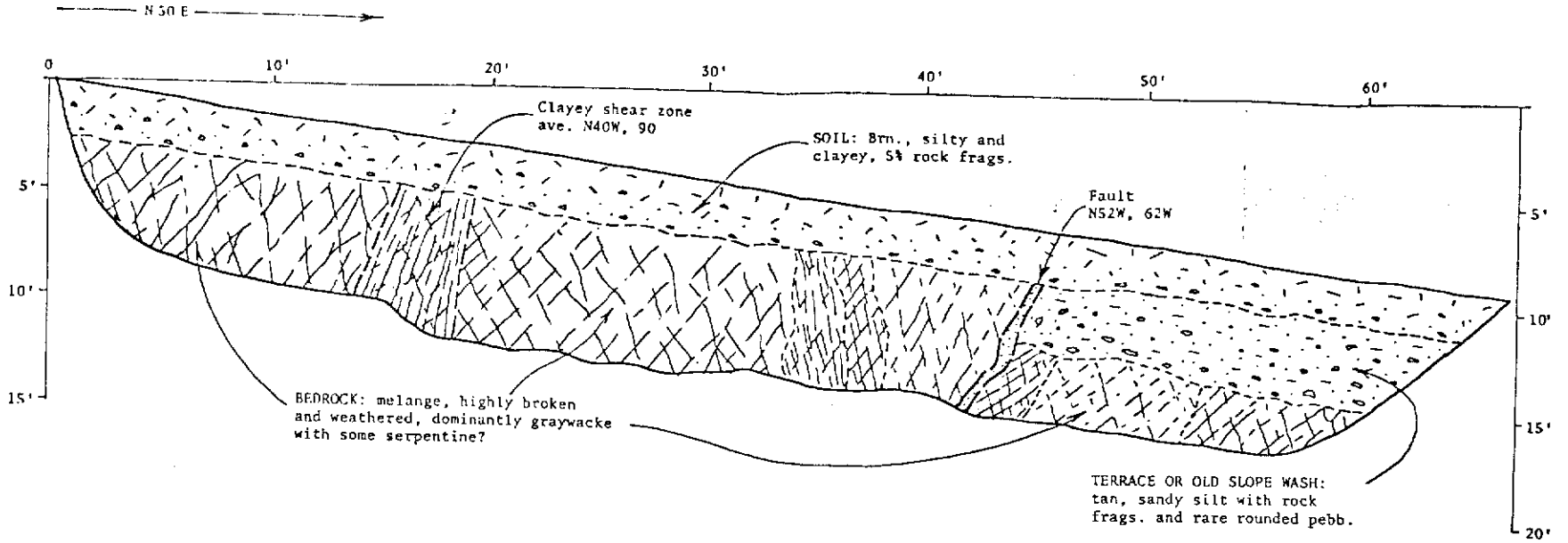


Figure 5 to FER-170
GEOLOGIC LOG
TRENCH 2
(Envicom, 1977)

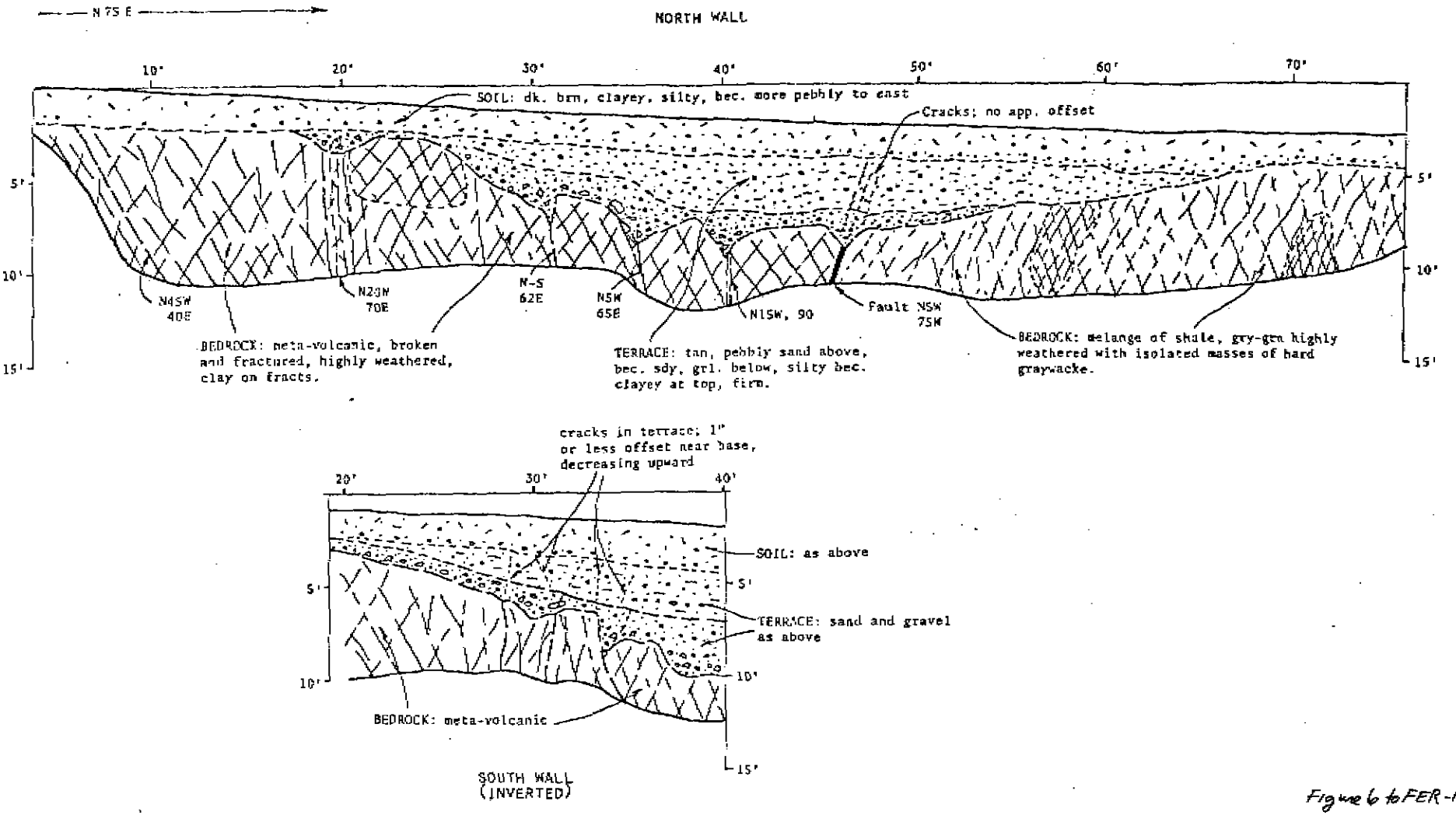
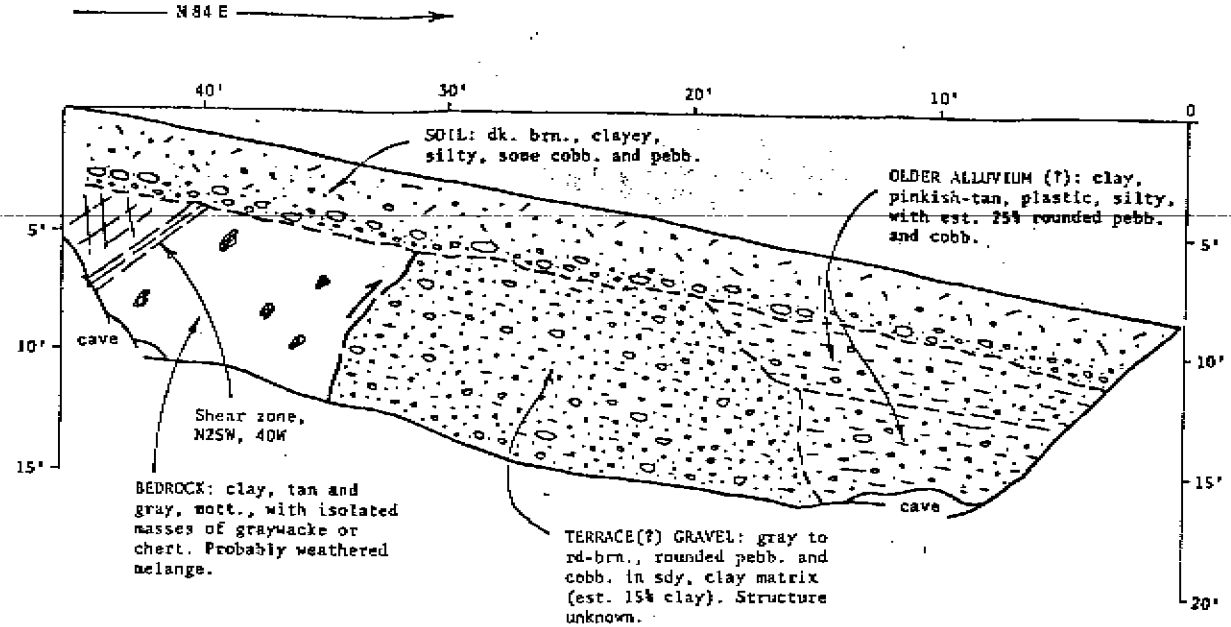


Figure 6 to FER-170

GEOLOGIC LOG
TRENCH 3

(Envicom, 1977)



NOTE: Trench excavated near groundwater anomaly, and caving was extensive in west end (not logged). Interpretation of materials and relationships shown based in part on comparison with Trenches 5 and 6.

Figure 7 to FER-170
GEOLOGIC LOG
TRENCH 4
(Envicom, 1977)

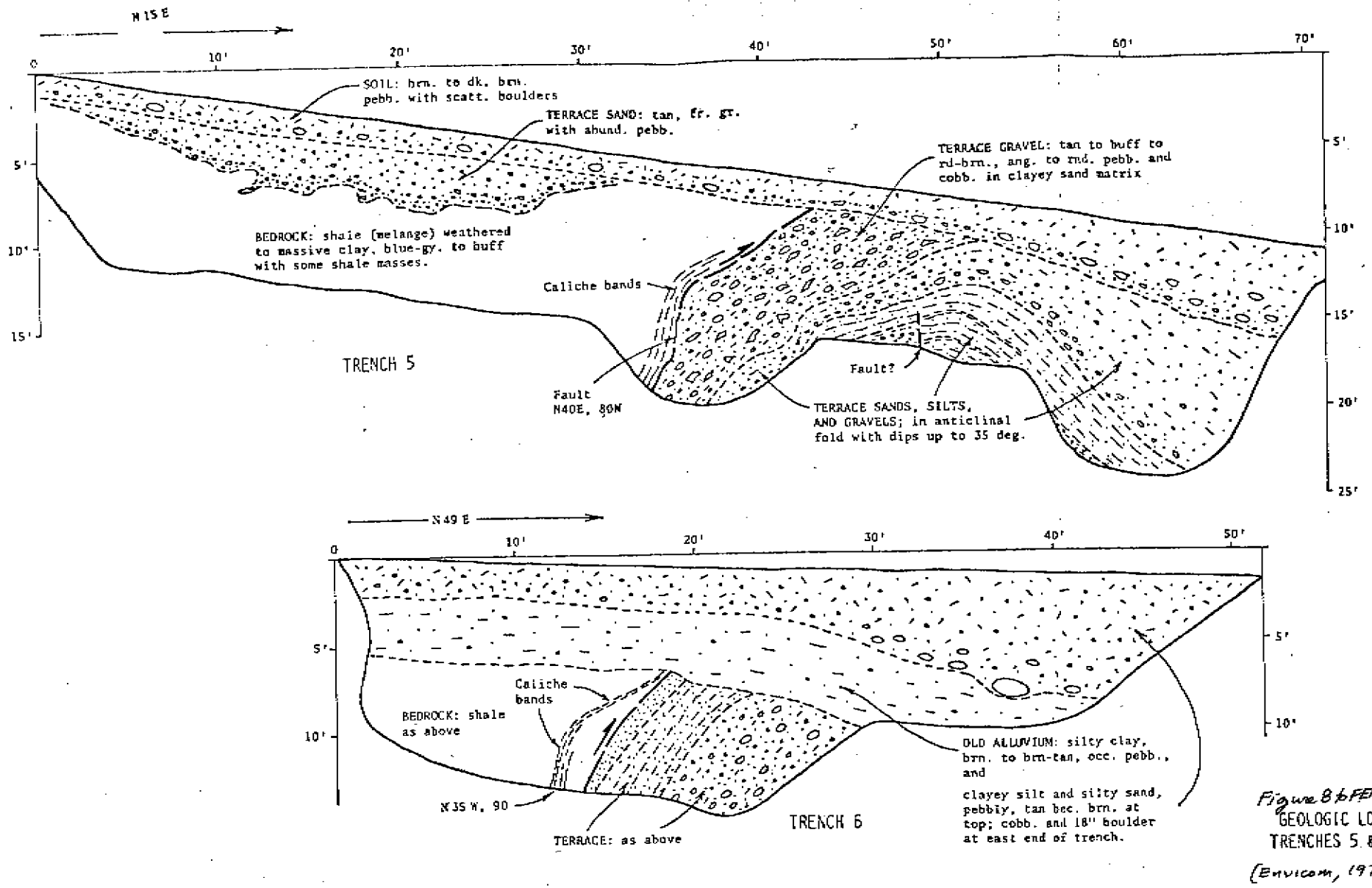


Figure 8 b FER-170

GEOLOGIC LOGS
TRENCHES 5 & 6

(Envicom, 1977)

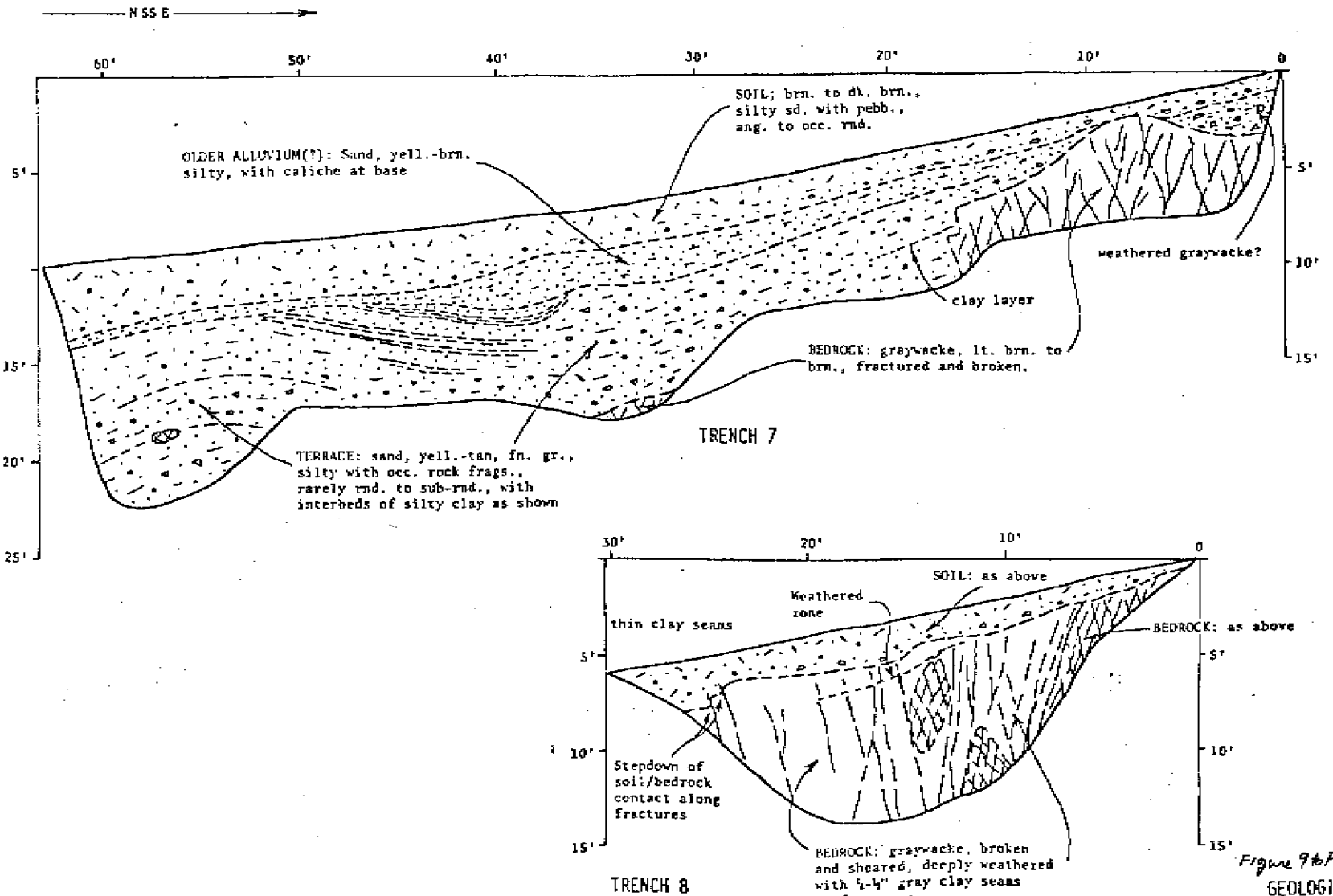


Figure 9 to FER-170
GEOLOGIC LOGS
TRENCHES 7 & 8
(Envicom, 1977)